Trend and Growth analysis of area, production and productivity of Rice crop in different Climatic Zone in Chhattisgarh State in India

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ARTICLE INFO	ABSTRACT	ORIGINAL RESEARCH ARTICLE

Examined the trend analysis of area, production and productivity of rice crop in different climatic zone in Chhattisgarh state. The production was highly significant and low growth rate of 2.44 percent in Northern hills followed by Chhattisgarh plains (2.04 percent) and Bastar plateau (0.63 percent) of Chhattisgarh state. The productivity of rice in different area that rice yield had marginally growth in Northern hills (2.26%) followed by Chhattisgarh plains (1.38%) and Bastar plateau (0.10 percent) of Chhattisgarh state. In this study the overall rice area, production and productivity was low significant and growth rate of 0.54 percent, 1.93 percent and 1.38 percent.

INTRODUCTION

Agriculture is the only means of employment for almost all two-thirds of rural people in India and provides food grains to all the rising population in the country. It also provides fodder to sustain livestock comprising of cattle, buffaloes, sheep and poultry etc. Agriculture sector plays a vital role in Indian economy and it is the backbone of the country. Around 55 per cent of population is engaged in agriculture and allied activities and it contributes around 17 per cent to the country's Gross Value Added (Annual Report, 2016-17). Rice is the principal food crop in India. Rice is grown in an area of 43.79 M ha with a production of 116.42 Mt and productivity of 2659 kg/ha in the country occupying 22 per cent of gross cropped area of the country. Rice contributes 41 per cent of total food grain production occupying 35 per cent of food grain area of the country (2018-19).In Chhattisgarh, rice occupies average of

3.6 million hectares with the productivity of the state ranging between 1.2 to 1.6 tons per hectare depending upon the rainfall (Status Paper on Rice for Chhattisgarh). Under the conditions of low growth rates concerted efforts are required to increase the production in all major producing states to reach the projected demand of rice by 2050. Chhattisgarh is a state in central India; with a geographical area of 137.90 lakh hectares.

MATERIALS AND METHODOLOGY

The study was based on secondary data. The secondary data was collected from Chhattisgarh agriculture statistics, land record office, annual districts statistics and other published and unpublished reports. Methodology

Selection of Crop

Selection of area Chhattisgarh state from India was considered purposely for study purpose and all the 3 agro climatic zones viz Chhattisgarh plain, Bastar plateau and

northern hills were considered for details investigation. After considering zone, form each zone, all the covered districts were selected for analysis purpose. The rice crop was selected for the Present study in the all three agro climate region and all 27 district of Chhattisgarh state. The time series data from 2009-10 to 2018-19 were used to analyses absolute change, relative change, C.V, trend, growth rate, area effect, yield effect and interaction effect and projection purpose.

Analytical tools which are used to analyses the growth rates of rice crop in the Chhattisgarh state trend analysis was carried out using linear trend method.

Linear trend, $Y = a + b x$

Where, Y= Dependent variables (Area, Production and productivity)

a = Intercept

b = Regression co-efficient

x = Period (years)

N=number of observation Student

Student t test

$$t = |x - \mu| / s\sqrt{n}$$

Where, t= test statistics

μ=mean of sample

S=sample standard deviation

N=sample size

t calculated>t tabulated (significant)

t calculated< t tabulated (Nonsignificant)

Simple Growth Rate (SGR)

SGR (%) = $b/y \times 100$

Compound Growth Rate (CGR)

The compound growth rates (CGR) used to examine the growth rate in area, production and productivity of rice in Chhattisgarh state as a whole, using the exponential growth function of the form.

$Y = ab^t$

CGR (%) = (Antilog b – 1) x 100

RESULT AND DISCUSSION

Calculate the trend for area, production and productivity of rice crop in different agro climatic zone of Chhattisgarh state, the time series data of important variables viz area, production and productivity with special highlights on rice crop had been used for calculate the simple statistical tools like absolute change, relative change and coefficient of variation had been discussed accordingly. Linear trend was used for estimating the trend and growth rate. The value of regression coefficient of area, production and productivity of rice under different agro climatic zone of Chhattisgarh state had been provided in Table 1, 2 to 3.

Chhattisgarh plains

In case of Chhattisgarh plains, the value of regression coefficient of area in rice crop was found positive and significant at 5% and 1% level of significant in Balod, Balodabazar, Bemetara, Dhamtari, Durg, Gariyaband, Kabirdham, Kanker, Korba, Mahasamund, Mungeli and Rajnandgaon district, respectively while the regression coefficient of area in rice crop was found negative in case of Bilaspur, Janjgir-Champa, Raigarh and Raipur district in Chhattisgarh plain zone. In case of regression coefficient of production for rice crop out of 16 districts only 7 districts viz Balod, Balodabazar, Bemetara, Bilaspur, Kabirdham, Kanker and Raipur have negative trend value which shows that area of rice crop in this district were observed decreasing. while in remaining district viz Dhamtari, Durg, Gariyaband, Korba, Mahasamund, Mungeli, Raigarh and Rajnandgaon the value of regression coefficient was estimated positive and significant which indicate an increasing trend in area of rice crop. The value of regression coefficient of rice crop for productivity was found positive and significant at 5% level in Balodabazar, Bilaspur, Dhamtari, Durg, Gariyaband, Janjgir Champa, Korba, Raigarh, Raipur and Rajnandgaon districts. It was observed to be 0.01, 0.02, 0.04, 0.06, 0.04, 0.03, 0.01, 0.07, 0.12 and 0.001 percent, respectively. In case of productivity of rice crop the regression, coefficient was found negative and significant in Balod, Bemetara, Kabirdham, Mahasamund and Mungeli district with 0.04, 0.06, 0.03, 0.02, 0.01 and 0.04 percent, respectively.

Table 1: Linear trend in area, production and productivity of rice crop in Chhattisgarh plains zone of Chhattisgarh State

District	Area		Production		Productivity	
	Regression co-efficient(b)	intercept(a)	Regression co-efficient(b)	intercept(a)	Regression co-efficient(b)	intercept(a)
1.Balod	0.80* (1.57)	176.18	-5.54* (14.68)	350.22	-0.04* (0.11)	1.99
2.Balodabazar	0.95* (2.03)	222.84	-5.54* (14.68)	351.12	0.01* (0.07)	1.51
3.Bemetara	3.58* (3.52)	140.70	-4.05* (11.10)	246.74	-0.06* (0.08)	1.93
4.Bilaspur	-9.14* (1.25)	291.80	-7.11* (28.63)	446.18	0.02* (0.13)	1.58
5.Dhamtari	1.33* (5.92)	166.04	9.80* (37.69)	166.04	0.04* (0.16)	2.21
6.Durg	2.20* (2.75)	115.11	10.66* (24.85)	11.00	0.06* (0.17)	1.54
7.Gariyaband	1.98* (2.02)	125.50	8.22* (19.19)	154.76	0.04* (0.13)	1.25
8. Janjgir-Champa	-0.91* (3.41)	265.51	4.07* (30.42)	695.02	0.03* (0.11)	2.60
9.Kabirdham	1.94* (2.04)	90.78	-0.52** (7.29)	129.80	-0.03* (0.08)	1.41
10.Kanker	1.64* (1.65)	169.23	-1.55* (34.03)	344.18	-0.02* (0.19)	2.01
11.Korba	0.02* (0.10)	109.18	1.23* (9.51)	134.27	0.01* (0.09)	1.24
12.Mahasamund	2.86* (3.02)	258.31	2.55* (24.22)	419.72	-0.01* (0.09)	1.61
13.Mungeli	1.68** (1.67)	101.13	0.60** (9.62)	229.30	-0.04* (0.09)	2.24
14.Raigarh	-72.65* (1.95)	240.80	14.80* (27.22)	278.71	0.07* (0.11)	1.16
15.Raipur	-35.59* (2.81)	442.56	-29.77* (32.93)	600.47	0.12* (0.18)	1.22
16.Rajnandgaon	3.40** (4.10)	264.40	3.36* (3.97)	381.90	0.001* (0.13)	1.43
Total	-95.87	3180.0	-2.66	132.73	-57.86	1.69

*, ** shows 5 and 1 percent level of significance, respectivelyFiginbracketsshowstheSEofconcernedregressionco-efficient

On the above table we concluded that the trend coefficient of production was positive and significant in Dhamtari Durg Gariyaband, Janjgir-Champa, Korba, Mahasamund, Mungeli, Raigarh and Rajnandgaon and in productivity the district covered was Balodabazar, Bilaspur, Dhamtari, Durg, Gariyaband, Janjgir Champa, Korba, Raigarh, Raipur and Rajnandgaon gained its impact of the crop. The analysis also revealed that there was a significant reduction in area under Bilaspur, Janjgir-Champa, Raigarh and Raipur districts although decreasing its impact

in area location but keep its productivity level in all the districts which is encouraging.

Bastar Plateau

As far as the trend coefficient of production of rice crop was concerned the value of coefficient was negative and significant in Bastar, Dantewada, Kondagaon and Narayanpur district but only in two districts viz Bijapur and Sukma were found positive and significant at 5% level. The trend coefficient for rice crop area were observed negative and significant in Bastar, Bijapur, Dantewada, and Narayanpur while in Kondagaon and Sukma districts the coefficient was positive and significant at 5% level. The trend coefficient for rice productivity was negative and significant in all the districts of Bastar plateau zone.

Table2: Linear trend in area, production and productivity of rice crop in Bastar Plateau zone of Chhattisgarh State

District	Area		Production		Productivity	
	Regression co-efficient (b)	intercept (a)	Regression co-efficient (b)	intercept (a)	Regression co-efficient (b)	intercept (a)
1. Bastar	-10.80* (0.5)	214.37	-6.82* (16.18)	257.65	-0.04* (0.12)	1.99
2. Bijapur	-0.98* (0.69)	98.89	0.53* (7.40)	57.47	-0.03* (0.12)	1.70
3. Dantewada	-60.26* (0.83)	115.68	-10.03* (11.15)	171.54	-0.04* (0.16)	1.62
4. Kondagaon	1.10* (1.14)	94.79	-0.87* (10.07)	157.28	-0.02* (0.10)	1.65
5. Narayanpur	-0.21* (0.57)	26.03	-1.23* (3.49)	39.30	-347.00** (0.12)	1.48
6. Sukma	1.93* (1.91)	65.64	2.47* (10.11)	113.16	-0.0004* (0.13)	1.69
Total	-69.22	615.4	-15.95	796.4	-347.13	10.13

*,**shows 5 and 1 percent level of significance, respectively
Fig in brackets shows the SE of concerned regression co-efficient

On the above table in case overall study we concluded that the area of rice was increased in Kondagaon and Sukma district and in production point of view Bijapur and Sukma district maintain its importance. But in case of productivity trend, all the districts found negative and significant trend which indicates that there is no impact of improved technology in that area.

Northern hills

The value of regression coefficient of area in rice crop was found positive and significant at 5% level of significant in Balrampur, Jaspur, Surajpur and Sarguja district respectively while the regression coefficient of area in rice crop was found negative in Korea district in Northern hills zone. In case of production the value of regression coefficient for rice crop out of 5 districts only 2 districts viz Jashpur and Sarguja have negative trend value which shows that area of rice crop in this district were observed decreasing while in remaining districts viz Balrampur, Korea and Surajpur the value of regression coefficient was estimated positive and significant which indicate an increasing trend in area of rice crop. In case of regression coefficient of productivity of rice crop was found negative and significant in Balrampur and Jashpur district with 0.02 and 0.04.

Table3: Linear trend in area, production and productivity of rice crop in Northern Hills zone of Chhattisgarh state

District	Area		Production		Productivity	
	Regression co-efficient(b)	Intercept (a)	Regression co-efficient(b)	Intercept (a)	Regression co-efficient(b)	Intercept (a)
1. Balrampur	0.98* (1.16)	75.48	0.27* (6.09)	129.14	-0.02* (0.01)	1.71
2. Jashpur	0.39* (0.52)	179.23	-7.16* (7.29)	268.93	-0.04* (0.09)	1.49
3. Korea	-0.14* (0.76)	69.39	1.43* (9.62)	84.39	0.02* (0.13)	1.20
4. Surajpur	0.04* (0.49)	105.70	1.67* (6.89)	154.60	0.01* (0.06)	1.46
5. Sarguja	18.36* (1.63)	255.74	-9.93* (9.86)	254.62	0.05* (0.07)	1.13
Total	19.63	685.54	-13.72	891.68	0.02	6.99
*,**shows 5 and 1 percent level of significance, respectively Fig in brackets shows the SE of concerned regression co-efficient						

According to above information overall we could be concluded that the area of rice was increased in Balarampur Jashpur Surajpur and Sarguja district. In production point of view Balrampur, Korea and Sarguja maintained it importance. But in case of productivity trend in Korea, Surajpur and Sarguja were positive and significant. The analysis also revealed that there was significant reduction in area under Korea district although decreasing its importance in area allocation but keeping its productivity level in all the districts which is encouraging.

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